XIV. "Some Observations on Sea-water Ice." By J. Y. Buchanan, Chemist on Board H.M.S. 'Challenger.' Communicated by Professor A. W. Williamson, For. Sec. R.S. Received June 9, 1874.

Many different opinions have been expressed as to the nature of ice resulting from the freezing of sea-water, all agreeing, however, in one point, that, when melted, the water is unfit to drink. During the antarctic cruise of H.M.S. 'Challenger' I took an opportunity of examining some of the broken pack-ice, into which the ship made an excursion on the morning of the 25th of February, and also some ice which had formed over night in a bucket of sea-water left outside the laboratory port.

The piece of pack-ice which I examined was, in substance, clear, with many air-bells, most of them rather irregularly shaped. Two portions of this ice were allowed to melt at the temperature of the laboratory, which ranged from 2° C. to 7° C. The melting thus took place very slowly, and made it possible to examine the water fractionally. My experiments consisted in determining the chlorine in the water by means of tenth-normal nitrate-of-silver solution, and observing the temperature of the ice when melting.

A lump, which, when melted, was found to measure 625 cub. centims., was allowed to melt gradually in a porcelain dish. When about 100 cub. centims. had melted, 50 cub. centims. were taken for the determination of the chlorine; they required 13·6 cub. centims. silver solution, corresponding to 0·0483 gramme chlorine. When 560 cub. centims. had melted, 50 cub. centims. were titrated, and required 1·6 cub. centim. silver solution, corresponding to 0·0057 gramme chlorine. The remainder (65 cub. centims.) of the ice was then melted and 60 cub. centims. titrated; they required 0·39 cub. centim. silver solution, corresponding to 0·0014 gramme chlorine. We have then in the first 50 cub. centims. 0·0483 gramme chlorine, in the next 510 cub. centims. 0·0579 gramme, and in the last 65 cub. centims. 0·0015 gramme. Hence the whole lump (625 cub. centims.) contained 0·1077 gramme chlorine, or, on an average, 0·1723 gramme chlorine per litre. A qualitative analysis of the water showed lime, magnesia, and sulphuric acid to be present.

Another piece of the ice was pounded and allowed to melt in a beaker. When about half was melted, the water was poured off and found to measure 95 cub. centims.; 75 cub. centims. were titrated with silver solution, and required 1·9 cub. centim. The remainder, when melted, measured 130 cub. centims., and required 0·9 cub. centim. silver solution. Hence the first fraction of 95 cub. centims. contained 0·0085 gramme chlorine, and the second of 130 cub. centims. 0·0032 gramme chlorine. The whole quantity (225 cub. centims.) of ice therefore contained 0·0117 gramme chlorine, or, on an average, 0·0520 gramme per litre.

From these results it is evident that the ice under examination was very far from being an homogeneous body; and, indeed, nothing else could be expected, when it is borne in mind that the ice in question owes its existence, not only to the *bonâ fide* freezing of sea-water, but also to the snow which falls on its surface and is congealed into a compact mass by the salt-water spray freezing amongst it.

The ice formed by freezing sea-water in a bucket was found to have formed all round the bottom and sides of the bucket, and forming a pellicle on the surface, from which and from the sides and bottom the ice had formed in hexagonal planes, projecting edgewise into the water. The water was poured off, the crystals collected, washed with distilled water, pressed between filtering-paper, and one portion melted. It measured 9 cub. centims., and required 4 cub. centims. silver solution, corresponding to 0·0142 gramme chlorine, or 1·5780 gramme per litre. The other portion was used for determining the melting-point. The thermometer used was one of Geissler's *normal* ones, divided into tenths of a degree Centigrade, whose zero had been verified the day before in melting snow. The melting-point of the ice-crystals was found to be $-1°·3$. The temperature of the melting mass was observed to remain constant for twenty minutes, after which no further observations were made.

In the same way the melting-point of the pack-ice was determined. The fresh ice began to melt at $-1°$; after twenty minutes the thermometer had risen to $-0°·9$, and two hours and a half afterwards it stood at $-0°·3$, having remained constant for about an hour at $-0°·4$. Another portion of the ice rose more rapidly; and when three fourths of the ice was melted, the thermometer stood at 0°.

These determinations of the temperature of melting sea-water ice show that the salt is not contained in it only in the form of mechanically enclosed brine, but exists in the solid form, either as a single crystalline substance or as a mixture of ice- and salt-crystals. Common salt, when separating from solutions at temperatures below 0°, crystallizes in hexagonal planes; sea-water ice, therefore, may possibly have some analogy to the isomorphous mixtures occurring amongst minerals.

XV. "On the Physiological Action of the Chinoline and Pyridine Bases." By John G. M'Kendrick and James Dewar, Edinburgh. Communicated by Professor J. Burdon Sanderson, M.D., F.R.S. Received June 11, 1874.

(Abstract.)

It is well known that quinine, cinchonine, or strychnine yield, when distilled with caustic potash, two homologous series of bases, named the pyridine and chinoline series. Bases isomeric with these may also be